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ABSTRACT

The report describes the procedures and products of seven materials adaptation projects sponsored by the Office of Special Education Programs in the U.S. Department of Education and discusses ideas and techniques that can be adopted by school districts in their own materials adaptation efforts. Project requirements prescribed that adaptations should result in materials that could be used independently by students, would be adaptable to a variety of disabilities, would be accompanied by supplements (such as manipulatives and games), would have different entry levels, and would provide for evaluation of student progress. The report is organized according to the eight steps of curriculum adaptation used by the projects to develop their adapted materials: (1) develop a learner characteristics profile; (2) determine teachers' instructional needs; (3) analyze textbook and compare with needs of learners and teachers to determine areas requiring modification; (4) determine specific modifications to be made; (5) develop goals and objectives for the adaptations; (6) implement ongoing formative evaluation; (7) select and train teachers for field testing; and (8) produce prototype, evaluate, and revise to develop final product. Appendixes provide descriptions of the seven funded projects and their products and a bibliography. (DB)

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Adapting Instructional Materials for Mainstreamed Students

by Jane Burnette

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Issue Brief 1

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by Jane Burnette

Issue Brief 1
The ERIC/SEP Special Project on
Interagency Information Dissemination

The ERIC/SEP Special Project on Interagency Information Dissemination is designed to provide information about research in special education, in particular, research funded by the Division of Innovation and Development, Office of Special Education Programs, U.S. Department of Education. This product was developed by the ERIC Clearinghouse on Handicapped and Gifted Children under contract no. 400-84-0010 with the Office of Special Education Programs, U.S. Department of Education. The content, however, does not necessarily reflect the position of SEP/ED, and no official endorsement by either SEP or ERIC of these materials, the products discussed in this report, or the publications mentioned should be inferred.

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Preface

From 1981 to 1985, the Office of Special Education Programs in the U.S. Department of Education sponsored the adaptation of several widely used textbook-based curricula to make them more appropriate for mainstreamed mildly handicapped students. The procurement was designed to provide instructional materials in a form appropriate for a wide range of abilities and learning styles, and thereby make available to regular classroom teachers the educational media and materials they need to effectively instruct handicapped students integrated into their classrooms. It was hoped that these adaptation projects would act as a catalyst to materials developers and publishers by developing flexible techniques and products appropriate for use by an entire class of students.

Many textbook-based curricula currently in use are not designed for classes of students with a wide range of abilities or diverse learning styles. Although 68% of all handicapped children receive the majority of their education in regular education classrooms, teachers report problems in achieving instructional integration of these students that result from a discrepancy between their needs and the instructional materials used in class. At the time of the projects reported here, teachers were modifying approximately 40% of the materials they used.

A 1978 Educational Testing Service survey of more than 30,000 teachers conducted as part of a national needs assessment of educational media and materials for the handicapped highlighted the need to modify curricula to fit the varying skills and abilities of mainstreamed students. Surveyed teachers gave as their primary reason for needing supplementary materials a lack of variety and flexibility in the materials currently available. They indicated that the most significant problems with existing materials arose from the vocabulary, use of repetition and manipulatives, and formats. They needed adapted materials that

- Could be used independently by students.
- Are adaptable to a variety of disabilities.
- Are accompanied by more supplements, including manipulatives and games.
- Have different entry levels.
- Provide for evaluation of student progress.

The teachers' needs served as goals for seven curriculum adaptation projects sponsored by the U.S. Department of Education. These projects focused their modifications on such areas as vocabulary, rate of concept introduction, amount of repetition, inclusion of manipulatives, use of gaming, and design for independent use. The projects were conducted by a wide variety of organizations, including private educational research centers (Macro Systems, Inc., Education Development Center, Inc., and the Technical Education Research Centers), university centers (Utah State University Developmental Center for Handicapped Persons and the Experimental Education Unit of the University of Washington), and an intermediate educational unit (the Allegheny Intermediate Unit, Pittsburgh, Pennsylvania).

The Office of Special Education Programs required that the materials be designed so that mildly and moderately handicapped students could use them without being singled out; this requirement resulted in materials that benefit all students in the regular class, including high performing students, nonhandicapped students with learning problems, and mainstreamed handicapped students. Further, contractors were required to involve the textbook publishers and authors in the adaptation design. This ensured that the adaptations would meet the learning objectives of the original text, and also enhanced the products' marketability and potential for commercial publication. The following **Issue Brief** discusses the procedures and techniques used by these projects to develop their materials.

Introduction

This report describes the procedures and products of seven materials adaptation projects sponsored by the Office of Special Education Programs in the U.S. Department of Education, and discusses ideas and techniques that can be adopted by school districts in their own materials adaptation efforts. The Department of Education projects adapted widely used elementary and secondary curricula in social studies, science, and mathematics. The textbooks selected for adaptation had high national sales volumes, indicating wide future use by school systems across the nation.

The projects created a number of imaginative products to adapt these texts to the needs of handicapped learners in regular classrooms. For example, the project conducted by the Technical Education Research Centers created the first microcomputer-based adaptation of an elementary science curriculum for students with mild learning disabilities. Macro Systems, Inc., developed audiocassettes depicting the life of the common man in different times and historical situations based on a secondary social studies text, *Our Common Heritage*. The cassettes were accompanied by supplementary aids for the text, a world history data base, and a computerized management system for student data. The Allegheny Intermediate Unit in Pittsburgh, Pennsylvania, produced a resource book providing models, examples and reproducible masters of adapted curricular materials; the project also designed and implemented a computerized procedure that compares individual students' learning characteristics and their teachers' styles to provide a list of instructional techniques and supplementary aids appropriate for the student. The other projects created similarly imaginative adapted materials that would be fun for students to use. These products utilized many types of instructional media and supplementary aids, such as prereading organizers, framed outlines, study guides and worksheets, audiocassettes, and computer-based aids.

This report is organized according to the eight-step procedure used by the projects to develop their adapted materials. Each step is discussed in a separate section that includes examples of the projects' approaches and experiences. Appendix A provides a brief description of each of the projects and its package of adapted products. A bibliography listing sources of information on the curriculum adaptation process and its constituent steps comprises Appendix B.

Overview of Project Procedures

Although some of the procedures used by the projects require resources beyond those available to individual teachers, many of the techniques are adaptable and useful ideas that can be implemented by teachers with school district support, and the more elaborate procedures can be implemented by school districts or intermediate units. As one project noted,

> Teachers themselves could develop similar sorts of materials. The process, however, is time-consuming, especially for complex texts. School systems that support this idea should be encouraged to provide paid time over the summer months to teachers who would be charged with developing adaptations of [texts]. Every effort should be made to take a team approach, by including both special educators and classroom subject matter teachers in the curriculum development effort. Such a team approach would ensure a better product, and it would also serve as the catalyst for improved communications between the resource room or consulting special educator and the classroom teacher. (Solomon, Education Development Center, 1985)

The Department of Education projects all followed a set of basic steps to curriculum adaptation, shown below. Although formative evaluation is shown as a step in the process, it was ongoing throughout the design and development of the materials. The remainder of this report will describe each step to curriculum adaptation and the approaches to each of these steps taken by the projects.

Basic Steps to Curriculum Adaptation

PHASE I. Needs Assessments

- Step 1. Develop a learner characteristics profile.
- Step 2. Determine teachers' instructional needs.
- Step 3. Analyze textbook and compare with the needs of learners and teachers to determine areas requiring modification.

PHASE II. Design and Development

- Step 4. Determine specific modifications to be made.
- Step 5. Develop goals and objectives for the adaptations.

PHASE III. Testing and Production

- Step 6. Formative evaluation (ongoing).
- Step 7. Select and train teachers for field testing.
- Step 8. Produce prototype, evaluate, and revise to develop final product.

PHASE I
Needs Assessments

The Department of Education projects took varied approaches to the assessments of learner characteristics, teacher needs, and the text to be modified. Their approaches were affected by the subject matter (social studies, science, or math), their philosophy toward the project, and whether they had targeted a specific handicapped population, such as students with learning disablities. The projects strived for flexibility so that the adapted curriculum could be used for an entire class with a wide range of abilities and learning styles, and by teachers with varying classroom organizations and teaching styles.

Step 1
Assessing Learner Characteristics

The development of a learner characteristics profile to guide design can be crucial to the success of adapted materials. The profile identifies the various means of providing students with access to the subject matter: It highlights skills that are difficult for students, so methods of conveying information that rely on these skills can be avoided; it also highlights student strengths that can be capitalized on. The projects investigated three aspects of learner characteristics:

- Characteristics associated with specific handicapping conditions.
- Current skill levels within the subject matter area.
- Individual abilities.

Learner characteristics: needs associated with learning disabilities. Two projects examined characteristics associated with learning disabilities. The project conducted by the Education Development Center, which modified an American history text, noted the following indicators of learning disabilities identified by Deshler (1978): limited attention span; memory disorders; and a variety of perception and communication disorders that affect vocabulary acquisition, concept formation, reading, oral communication, and written communication. Associated with these problems are lowered self-concept, poor self-perception, and reduced motivation as a result of the learning handicap.

The elementary science project conducted by the Technical Education Research Centers also focused on learning disabilities, noting that

> most children need a change away from reading as the primary source of science information, more time and encouragement to explore materials and phenomena, opportunities to report their findings and generalize discoveries, and motivating activities for practicing, test-taking, and applying their newly found ideas of cause and effect. Learning disabled students need these features and materials designed to overcome perceptual and memory handicaps. (Travis, Technical Education Research Centers, 1985)

Learner characteristics: mathematics skill levels. A learner characteristics profile based on subject matter skills was used by the Utah State University Developmental Center for Handicapped Persons, which adapted mathematics materials. Three standard tests, the Key Math, the Peabody Individual Achievement Test, and the Individual Computational Skills Program, were administered to students in the project's field-test districts. Subtests and test items were analyzed to determine student skills and deficiencies in the following areas: counting and place value, addition, subtraction, multiplication, division, fractions, decimals, percentages, measurement, and word problems (applications).

Learner characteristics: individual focus. The third aspect of a learner characteristics profile is exemplified by the one developed by Macro Systems, Inc., which focused on the abilities of individual students as rated by their teachers. The project modified an American history text. A list of skills was compiled from a review of research and professional literature, and was presented in seven categories: personal/social skills, written langauge, oral language, interpreting maps and globes, understanding time and chronology, interpreting pictures and graphics, and thinking. Under each category, a set of skills was listed (examples are shown on the next page). Teachers were asked to indicate which skills are of greatest importance and to identify areas in which supplemental aids have the greatest

impact. Teachers identified the percentage of their mildly handicapped students who had extreme, some, and slight difficulty with each particular skill and the percentage of students who would greatly, somewhat, or slightly benefit from supplemental materials.

Although Macro Systems developed their own instrument to assess learner characteristics, other instruments are available commercially. For example, Meyers-Briggs publishes an inventory of learner style. In addition, some school districts have developed checklists from the information available in student files. A book available for $5 from the National Association of Secondary School Prinicpals, *Student Learning and Brain Behavior*, includes an annotated bibliography of learner characteristics profiles. (See Appendix B for further information.)

These three elements of learner characteristics profiles are important to consider before developing supplementary aids or modifying curricula. Although individual teachers wishing to modify materials may not have the time or resources to survey large numbers of students or use procedures as elaborate as those used by the projects, they can scrutinize the characteristics of their students from these perspectives to help focus the design of teacher-made supplements. The knowledge gained from such an examination can also aid teachers in other aspect of class management. In addition to using learning characteristics as guiding principles in the design of their adaptations, many projects included sections on learner characteristics in the teacher's manuals that accompanied their materials.

More elaborate procedures are feasible on the school district or regional level, as exemplified by a program developed by the Allegheny Intermediate Unit that matches student needs with teacher style, discusssed in the next section.

▪Step 1▪
Examples of Student Characteristics from a Student Needs Profile

Thinking Skills

- synthesizing
- classifying
- organizing information
- analyzing problems

Written Language Skills

- reading comprehension

Oral Language Skills

- summarizing
- reasoning
- interpreting

Interpreting Maps and Globes

Interpreting Pictures and Graphic Materials

- analyzing the organization and structure of charts
- identifying comparisons
- determining the bases on which graphs are built

Social Skills

- working independently
- focusing attention
- sustaining attention

Understanding Time and Chronology

Note. From Macro Systems, Inc., 1985.

▪Step 2▪
Assessing Teachers' Instructional Needs

To meet the needs of handicapped students, many teachers already modify their instruction through a variety of methods, including less lecturing and more concrete examples. However, a precise and structured assessment of teachers' styles, preferred instructional and evaluation techniques, and logistical constraints in relation to student characteristics can help to pinpoint the types of adapted and supplemental materials most needed. For example, if class time is at a premium, then "learner directed" materials such as student worksheets may be most beneficial. On the other hand, some teachers may want to promote group interaction or supplement lectures with visual aids.

The examples on the next column present some areas typically addressed on assessments of teachers' instructional needs. Assessing teacher needs in comparison to learner characteristics can help to fill in the gaps between actual and ideal learning results. The Allegheny Intermediate Unit, which modified a history curriculum, matched individual students' results on the learner characteristics profile to the teacher's style in order to identify areas of mismatch between student and teacher. Some examples of the kinds of problems discovered are

- The teacher uses large group instruction, but the student has difficulty learning in large groups.
- The student needs oral directions because of reading problems, but the teacher instructs students to read the directions given in the workbook. (Allegheny Intermediate Unit, 1984)

Commercial instruments that assess teacher style are also available. For more information on assessing teacher and learner characteristics, see *People Types and Tiger Stripes*, (Center for Applications of Psychological Type, Inc., 1983, Appendix B).

In addition to a teacher style profile, the AIU conducted a teacher survey of materials to highlight areas where adapted supplemental materials were needed. The diagnostic process was computerized and information from the various profiles was entered as new students entered history classes. The computer printed appropriate teaching options for each student, including examples of adapted materials.

▪Step 2▪
Examples of Topics Addressed in Teachers' Instructional Needs Assessments

Classroom Management
- classroom organization and structure
- grouping
- directions
- classroom rules
- motivation techniques

Presentation
- methods of presenting new information to students
- cognitive level

Practice and review
- materials
- methods of practice

Evaluation
- written tests
- class discussion
- projects
- test time limits
- test length content level of tests

Personal Style
- need for structure
- leadership style
- beliefs about how students learn
- discipline and management style

▪Step 3▪
Analyzing the Textbook

The Department of Education projects selected texts with a high national sales volume, indicating broad future use by school systems. The texts were analyzed to identify aspects that did not meet the identified student and teacher needs. For example, the Education Development Center conducted a survey of American history texts, which revealed a number of common characteristics that make their use by students with learning disabilities difficult: their length (often over 800 pages), highly sophisticated vocabulary, high reading levels, and difficult organization.

> [American history] texts are notorious for telescoping hundreds of years of history into many densely packed pages. All of the textbooks we reviewed provided students with a detailed chronology of our nation's history. In the mix of dates, events, historical personalities, wars, and other historical facts, important underlying concepts are rarely highlighted. For able readers, an understanding of the u nderlying concepts emerges from the rich narrative, but for poor readers or less able st dents, the immersion of concepts in a mix of detail can be overwhelming. Improved student access and pathways to the text [are needed]. (Solomon, Education Development Center, 1985.)

Some projects, like the Allegheny Intermediate Unit, took their analyses one step further and developed unit and chapter hierarchies that outline critical concepts, facts, and ideas based on Bloom's Taxonomy of Cognitive Levels. Others identified one or two critical concepts from a review and content analysis of each chapter. These concepts were used in developing adapted products that included only the most important historical information.

The aspects of the text that were typically examined in the analyses are shown in the next column.

▪Step 3▪
Features Typically Examined in Textbook Analysis

Material Content
- vocabulary and reading level
- concept development and generalization
- reasoning and decision making
- specific skill development

Methods of Presentation/Organization
- sequence of material
- amount of material presented
- method of presentation
- type of directions given
- amount of repetition and review
- type of evaluation and testing

Supplementary Materials
- student study aids (activity sheets, overviews, etc.)
- descriptions of learning objectives, key concepts, and teaching strategies

Format
- design, layout, and print organization of teaching units
- large or small group usage
- independent student usage
- effective use of graphic display, photographs, and illustrations

PHASE II
Design and Development

The design and development phase brings the information from the needs assessments together to form the specifications for a set of adapted materials structured to meet identified needs. The two steps in the design and development phase are (1) determine the specific modifications to be made, and (2) develop goals and objectives for the adaptations. Throughout the design and development process, formative evaluation as described in Step 6 was ongoing.

Step 4
Determining the Specific Modifications to Be Made

The projects tried to create adapted materials that would be flexible enough to be used under different instructional conditions with a variety of learners. Once they had identifed the problematic areas or aspects of the text to be modified, they selected formats that would meet student and teacher needs. An example of one project's products related to student needs is presented on the next page. The design phase of curriculum adaptation represents a creative process that cannot be described in a step-by-step manner. Each design situation is unique, and each effort differs in the human and financial resources and time constraints that must be placed on it.

The Department of Education projects' common goal was to teach the basic learning objectives of the text equally well to all students in the regular class. They kept special student characteristics in mind throughout the development process and incorporated specific techniques to address these needs. Examples of the formats and special techniques used by the projects and their goals and objectives are given after Step 5. Although many of the techniques used by the projects require time or resources beyond those available to individual teachers, many formats and techniques are not particularly elaborate or time consuming.

In developing materials to meet the needs of special learners, the projects created products that can enhance the motivation and learning of the entire class. For example, the Education Development Center's American history project wanted to include experiential home activities in their modifications. They designed an activity for each of the 12 chapters of the text that would involve students actively in historical investigations in which they must seek information from adults. In one of these activities, students are asked to create a list of technology in the home during their grandparents' childhood, their parents' childhood, and their own childhood. In another activity, students interview their parents and other adults about the Vietnam War.

The Technical Education Research Center's microcomputer-based science project wanted a more tangible way of demonstrating the core concept of matter and heat energy, that is, that all matter is made up of molecules in motion, and adding or removing heat energy changes the speed and arrangement of the molecules; this in turn produces changes in the physical properties of matter. To demonstrate the concept, the developers designed a picture of molecules in motion on the computer screen. Temperature probes connected to the computer are calibrated with ice and boiling water to show the motion of water molecules in various states of matter: solid, liquid, and gas. As the probe touches ice, water, and water vapor, the molecules depicted on the screen move faster and farther apart.

At the University of Washington's Experimental Education Unit, an extensive series of experiments assessing the effectiveness of different types of supplementary materials was conducted. For example, one study assessed vocabulary sheets and study guides. Both of these techniques were found to improve student learning; these improvements were shown for high performing students as well as those performing at lower levels, and for learning disabled students as well as nonhandicapped students. For a discussion of various study aids, see *Teaching Study Skills: A Guide for Teachers* (Devine, 1981, Appendix B).

Step 4

An Example of One Project's Products Related to Student Needs

Student Needs	Formats
Written language skills	
Reading comprehension	Chapter previews
Differentiating main ideas	Student activity sheets
Organizing ideas	Microcomputer software
Thinking skills	
Hypothesizing/predicting	Student activity sheets
Comparing/contrasting	Microcomputer software
Synthesizing and abstracting	Audiocassettes
Clarifying/organizing information	
Analyzing problems	
Problem solving	
Associating related ideas	
Discussion of learning characteristics	Information for teachers

Note: From Macro Systems, Inc., 1985.

Step 5

Developing Goals and Objectives

Goals and objectives for the modified materials were developed in keeping with those of the original text. Macro Systems' project, which developed a history data base, listed the following student abilities as goals:

- Order and sort data.
- Form concepts.
- Set priorities in the use of criteria.
- Give examples as evidence.
- Discern relationships.
- Compare and contrast.
- Make inferences.
- Support judgments with reason.
- Problem solve.
- Construct hypotheses and make predictions.

The lessons lead students through a step-by-step approach to building and testing a hypothesis. After students and instructors become familiar with the material in the data base and the functions of the data base manager, they may develop their own questions, hypotheses, and different ways of using the data base. Term paper ideas may germinate from exploring the data in the files or the files themselves.

The project also developed a computerized instructional management system that helps teachers track student progress in meeting the objectives of the text related to these goals. Enabling objectives for each of the textbook objectives are included in the system, as well as a computer technique for charting the progress of each child as he/she meets the enabling objectives. As these products were developed, they underwent a continual design, development, and retest cycle. This cycle is discussed in the following section.

Types of Adapted Special Techniques Used

Products
Print Products Structured overviews Prereading organizers Chapter or section summaries Student study sheets Worksheets with feedback Tutorial quizzes Word or phrase banks
Audiotapes Audiotapes
Activities, Manipulatives, and Games Home activities Manipulatives Games
Microcomputer Software Courseware Instructional management systems

Step 5
Products Produced by the Projects, Goals and Objectives

Techniques	Enabling Objectives	Goals
	Print Products	
Frames around page to help students concentrate and focus attention	Create reading anticipation	Increase reading comprehension
Reduced reading level	Bypass reading problems	Learn important concepts
Address limited number of concepts	Stimulate discussion	Develop vocabulary
Limited number of items per page	Provide repetition of key elements	Cultivate skills such as graph, chart, and map reading
Pictures or diagrams		
Boldfaced vocabulary words	Provide review and repetition	
Location cues to help students find pages/paragraphs with answers	Avoid overwhelming the student	
Concise, boldfaced directions	Help students understand directions	
	Audiotapes	
Stopping points in script so amount of information presented can be adjusted to teacher and student needs	Simplify concepts and language	Develop listening skills
Sound effects, music, and dramatic techniques	Increase motivation	Learn important concepts
Summaries provided on tapes	Summarize material	
	Bypass reading problems	
	Capture student interest	
	Activities, Manipulatives, and Games	
Conversion of reading-based to hands-on activities	Increase motivation	Involve parents
	Develop concepts	Develop and apply concepts
		Develop another mode of learning
	Microcomputer Software	
Simple keyboard design	Bypass reading problems	Increase skills in graph, chart, and map reading
Simple screen design	Provide repetition and feedback when needed	
Help menus		
Adjustable length of pauses		
Self-pacing		
Feedback for responses	Capture student interest	
Sound effects	Increase motivation	
Graphics	Illustrate concepts graphically	
Inclusion of tools for instantaneous graphing of scientific data		Develop, research, and test hypotheses
Track student progress	More effective use of instructional time	
Capability for teacher modification of student discs	Enable teachers to custom design instruction	Greater individualization of instruction
Maintain data for and print reports		Provide documentation for parents, reports, IEP meetings
		Save administrative time

PHASE III
Testing and Production

The testing and production phase includes formative evaluation, teacher training, data collection, and final production of the materials. Formative evaluation was used throughout the development process to ensure that the new materials would be appropriate for the target students and would attract and sustain student interest, that teachers would find the materials helpful and convenient to use, and that the new materials would produce results with their target population similar to the results produced by the original materials with their target population. Teachers to participate in the evaluation were selected and trained in the use of the adapted materials. Data on the materials were collected by various means and compared to a set of evaluation criteria. Once it was determined that the evaluation criteria were met, the materials were produced in final form.

Step 6
Formative Evaluation

The formative evaluation consists of a cycle of

1. Identifying needs.
2. Adapting materials.
3. Sharing materials.
4. Implementing curriculum adaptations.
5. Evaluating materials.

As applied to the projects, this was a cyclical feedback process that involved key groups whose various needs and objectives were incorporated into the materials. The key groups included state and local school system administrators and curriculum specialists, site team leaders, participating teachers, the publisher and author, subject matter specialists, and software developers. Revisions to the adapted materials were ongoing throughout the formative evaluation cycle, based on criteria suggested by the needs assessments. As they were developed, the materials were reviewed and feedback was incorporated into the revisions.

Macro Systems, Inc., noted that for effective formative evaluation, the communications process should be flexible and fluid so that constructive and creative suggestions are not stifled from any party involved. Further, the process must be simple and easy to understand and implement. It must support the materials development effort rather than burden it. Clearly defined and agreed upon criteria must establish the parameters of the final form of materials and must build in the necessary quality control assurances. Finally, the formative evaluation process must conform to the school year and the instructional sequence used by particpating teachers.

Although teachers modifying materials may not have access to all of the key groups involved in the projects' evaluations, they can enlist other teachers to review and test their modifications. In addition to providing useful information for revisions, involving both regular and special education teachers in the process can serve as a catalyst to improve communication, and use of the same materials can set up a structure, common goals, and a schedule that allows special and regular teachers to work together and share their expertise.

Steps 7 and 8
Teacher Training, Data Collection, and Final Production

For field-testing throughout the evaluation cycle, participating teachers were trained in the use of the materials prior to incorporating them into regular classroom instruction. Generally, the purposes of the training were to ensure that the teachers understood the goals and techniques of the adaptations and the methods of collecting evaluation data. The Allegheny Intermediate Unit (AIU) broadened the scope of its training, however, and conducted a training program that is perhaps the most extensive of all of the projects. The AIU first conducted a survey on the training needs of the teachers it serves, and used this information to plan in-service training for the project. The objectives of the training were to help teachers become familiar with the characteristics of handicapped students and

the components of the project, to provide information on learning styles, and to show how to use the diagnostic information to plan classroom adaptations. The AIU continues its training for teachers in adapting curricula, and has developed a manual for teachers on curriculum adaptation, called the ADAPT Manual (Allegheny Intermediate Unit, Appendix B).

Training sessions held by the project also served as a forum for the exchange of ideas. For example, the Western Pennsylvania Regional Resource Center hosted a workshop for the teachers involved in the Allegheny Intermediate Unit's project. At this workshop, teachers surveyed commercial materials for ideas and described adapted activities that they had successfully implemented in their classrooms. An exchange of additional uses for these materials generated ideas for new and different products.

As the Department of Education projects tested their materials in classrooms, evaluation data were collected (a) on review forms, (b) through meetings and discussions, and (c) by observation. The data were compared with specified evaluation criteria, and the materials were revised and reevaluated. A sample of overall product evaluation criteria is shown below. Once it was felt that the products met these criteria, they were produced in final form and published.

▪Steps 6, 7, and 8▪
Sample Evaluation Criteria

1. Staff development program adequately trains teachers to understand and implement materials produced.
2. Materials are appropriate for target student population's learning styles and abilities as identified by student characteristics profile.
3. Materials attract and sustain student interest.
4. Materials can be easily and conveniently used by teachers.
5. Materials meet teacher needs identified in the instructional needs assessment.
6. Materials produce results in student achievement comparable to results obtained for regular students using the original materials.

Appendix A

Brief Descriptions of Projects and Their Products

Contractor: Macro Systems, Inc.

Contract Number: 300-83-0264
Grade and Subject: secondary world history
Textbook Adapted: *Our Common Heritage* published by Ginn and Co.
Product Publishers:
Data Base: "Quest for Files," Mindscape, 3444 N. Dundee Rd., Northbrook, IL 60062, Order No. 85-822 (Apple) ($125.00); 85-823 (IBM) ($125.00).
Audiotapes: "A Sound History of the World," DLM Teaching Resources, DLM Park, P.O.Box 4000, Allen, TX 75002, Order No. G1500J ($99.00)

Products:

1. *Teacher's guide.* Helps teachers understand the learning characteristics and needs of mildly handicapped students; includes approaches to management and organization of the ability-integrated classroom, general strategies for adapting curricula, and suggestions for creative supplemental activities for use with students. For each chapter, key vocabulary are defined and primary and enabling objectives provided. Teachers can use the objectives to develop activities and evaluate student performance. The guide contains chapter organizers and summaries at a reading level below grade 8. These previews and summaries create reading anticipation and serve as review aids; they can also be used as a stimulus for class discussion or as directed silent reading assignments.
2. *Student activity and study skills sheets.* Strengthen curriculum elements through creative repetition, vocabulary development and improved reading comprehension; and cultivate learning skills such as graph, chart, and map reading.
3. *Audiocassettes.* Depict life in historically important times and places; simplify concepts and language; and are graduated in complexity of content, concept load, and sophistication of vocabulary. Summaries are provided on the tapes. Sound effects, period music, and dramatic techniques enhance the scripts and capture students' interest, increasing motivation and listening skills. Supplemental print materials reinforce vocabulary, people and events, and the ideas and concepts in the audiocassettes. Concise sentences at a simplified reading level describe the content of the tapes and ask students to think about important concepts. Three student activity worksheets each focus on a different area: vocabulary and historical terms; people, places and events; and ideas and concepts.
4. *World history data base.* Helps students learn facts, understand relationships, and develop concepts while acquiring skills in the use of the computer. The software includes a simple data base manager integrated with data adapted from the textbook and many other sources.
5. *Electronic gradebook.* Helps teachers track student progress in meeting the objectives of the text. This Computerized Instructional Management System contains enabling objectives for each of the textbook objectives and a computer technique for charting the progress of each child as he or she meets the enabling objectives. It can record, compute, and print reports of student performance, eliminating hand calculations and other time consuming record keeping tasks. It is especially valuable for teachers who want to monitor student performance closely, have careful documentation of student status in meeting objectives, and provide colleagues and parents with detailed documentation. It was written for teachers with or without computer experience.

Contractor: Macro Systems, Inc.

Grade level and subject: Middle school American history
Textbook adapted: *America's Heritage* published by Ginn and Co.
Product publisher (audiotapes): "A Sound History of America," DLM Teaching Resources, 1 DLM Park, P.O. Box 4000, Allen, TX 75002, Order No. G8400J ($99.00)

Products:

1. *Audiocassettes depicting vignettes of life in different periods of American history.* Includes 10 two-sided cassettes that each present a 10-minute lesson. The program covers exploration to the present time and closely parallels the standard curriculum.
2. *Teacher's guide supplementary materials.* Includes an answer key, creative teaching suggestions, and discussion starters.
3. *Student activity sheets with recall questions for review.* Ninety-six blackline masters are included.

Contractor: Technical Education Research Centers

Contract Number: 300-83-0266
Grade level and subject: elementary science
Textbook adapted: *Heath Science* published by D.C. Heath and Co.
Product publisher: "Exploring Matter" (Grade 4) (Order no. ISBN 14608-0, $150.00) and "Heat Energy" (Grade 5) (Order no. ISBN 11109-0, $66.00), D.C. Heath and Company, 2700 N. Richardt Ave., Indianapolis, IN 46219, 1-800-334-3284

Products:

1. *Student software in three categories:*
   - Dictionary entries for quick reference and review of science concepts. The entries use attractive annotated graphics and simulations to demonstrate concepts such as the transition from solid to liquid gas in the water cycle; thermal expansion, contraction and conduction; and the construction of molecules from atoms.
   - Tutorial quizzes that give students unlimited chances to answer challenging questions. The quizzes provide corrective feedback and additional opportunities to answer if the student is incorrect.
   - Active learning and hands on use of materials in the form of games and demonstrations, graphics and graphs. Durable temperature probes attach to the computer's game ports, converting the computer to a tool for temperature collection and display in the form of thermometers and line graphs. As the student touches objects with the probes, the screen display instantly reflects temperatures. The program will print out a graph at any point during measurement. A game in which players race through a course touching the probe to objects of different temperatures is included.
2. *Teacher software that allows easy individualization of student disks.* Teachers can choose the student's learning programs and provide special features such as sound, adjusted length of pause prior to keyboard acceptance of input, special vocabulary, and screen format.
3. *A teacher's guide that provides complete lesson plans, including suggestions for enrichment activities, student sheets and tie-ins to other subjects.* It contains special sections on helping learning disabled students succeed in science, managing a computer-based science classroom, and using the teacher program effectively to individualize student disks.

Contractor: Education Development Center, Inc.

Contract Number: 300-83-0265
Grade level and subject: secondary American history
Textbook adapted: *A History of the United States* published by Ginn and Co.

Products:

1. *A Teacher's Resource Guide for use with the text.* The guide contains
   - 35 sets of self-instruction worksheets (one per chapter), each including an entry sheet that presents key vocabulary, a timeline to highlight key concepts, a structured series of questions, and a self-test to help students assess their own understanding of the chapter's main points (answer sheets are included).
   - Instructions to the teacher on ways to use the worksheets.
   - One classroom activity for each of the 12 units that provides teachers with methods of teaching important concepts in ways that build upon the strengths of learning disabled students but are suitable for the entire class. The activities do not require proficiency in reading and writing, but are concrete experiential activities that rely on oral or visual learning modes.
   - One home activity for each of the 12 units that involves students and parents or other adults in nonthreatening fun activities that build on an important unit concept.
   - A selected bibliography of literature on social studies and learning disabled persons.
2. *Prototype software for an eventual five part software series to promote the development of map skills.* It includes
   - A program for the first level.
   - Map graphics for all five levels.
   - A draft teacher's manual.
   - A draft students' activities workbook with paper-and-pencil activities correlated to all five levels of the software.

The five levels of software contain increasingly difficult maps and mapping operations. Students work first with finding straight line distance, then route distance, then they manipulate and draw inferences from map symbols, and finally, solve problems requiring facility with elevation maps. Each level breaks these operations down into finer subtasks, models the appropriate way to use the computer as a tool to solve problems, and provides students with an opportunity to solve their own problems. The prototype also provides a means to help students organize their responses in advance, reinforcement, and help keys.

For example, the software presents problems such as the following: students are asked to follow an Irish family circa 1850 as they emigrate to the U.S. A map is introduced on the screen and the computer demonstrates the steps to solving the problem. A new problem of the same type is presented and the student solves it following the steps demonstrated earlier. If the student is incorrect, he or she presses a help key and the computer demonstrates the proper steps to solving the problem the student was working on.

Contractor: Experimental Education Unit, University of Washington

Grade level and subject: secondary science

Textbook adapted: *Experiences in Physical Science*, published by Laidlaw Brothers Publishing Co.

Product publisher: "Physical Science Vocabulary Program," Precision Teaching Materials and Associates, Box 6262, Great Falls, Montana 59406

Products:

1. *The Physical Science Vocabulary Program.* The kit includes worksheets and exercises to develop vocabulary, an instruction manual and glossaries, a sample student folder, standard behavior chart, 20 vocabulary practice sheets, and an evaluation form.
2. *Evaluation of Approaches.* Two evaluations were conducted. In the first, experimental, control, and contrast groups in seven science classrooms in one school were used to compare the effects of study guides and precision teaching. There were 42 students in the experimental group, 70 in the control group, and 124 in the contrast group. The use of precision teaching and study guides were randomly scheduled. The gain scores on a multiple choice test showed both approaches equally effective, and both better than no adaptation of the materials for all students.

   The study guides emphasized the main idea of each chapter. Two types were used: (a) a framed outline containing a sequenced list of the chapter's main ideas, with key words blanked out (students filled them in while the teacher lectured), and (b) vocabulary exercise worksheets containing vocabulary words but not their definitions (students wrote them in) and another set of worksheets that contained definitions but omitted the words. An additional vocabulary exercise was word-to-definition matching. The primary means of instruction was lecturing. The teacher placed transparencies on the overhead projector, described the various points, and asked the students questions. The teacher also arranged some games for the children with vocabulary words.

   In the precision teaching approach, students were paired and one member of each pair read isolated words from a vocabulary drill sheet. Partners switched roles at one minute intervals. When students reached the proficiency level (80 w.p.m.), they were given a phrase sheet instead of the single word vocabulary sheet. On the third day, students were provided with a page of sentences that had some words left out; the students filled them in. They checked their own answers and recorded their scores. They continued using the practice sheets for five additional days.
3. *For the second evaluation,* a combination of vocabulary exercises and framed outlines was used in seven classes with 202 students. Over a period of 12 weeks, eight chapters of the text were covered; the modifications were used for some chapters but not for others. The vocabulary exercises were based on the precision teaching method, with eight words printed on a sheet in random order, each repeated at least three times. The framed outlines showed 10 to 12 of the chapter's main ideas in their logical sequence, presenting a structure that allowed teachers and pupils to identify and rehearse the sequence of the chapter's main ideas. Criterion-referenced tests were administered to the students before and after they worked on each chapter. The data showed that the scores of handicapped as well as nonhandicapped students were better when the chapters were modified.

Contractor: Allegheny Intermediate Educational Unit, Project TOSS (Teaching Options for Social Studies)

Contract Number: G0083-038

Grade level and subject: intermediate social studies

Textbook adapted: *Challenge of Freedom* published by Laidlaw Brothers Publishing Co.

Product publisher: "Study Activities" (Order No. 6575, $66.00) and "Teacher's Manual" (Order No. 6576, $2.19), Laidlaw Brothers Publishing Co., Thatcher & Madison, River Forest, IL 60305, (312) 366-5320.

Products:

1. *A book of reproducible masters for adapted materials and a teacher's guide.* The adapted materials formats include structured study guides and information organizers that help students summarize content; concept activities that explain abstract material in a concrete manner; group activities that provide for peer support and interaction; and games and

manipulatives that provide a fun and stimulating way to review for tests. The materials incorporated the following features:

- Location clues to help students find the page or paragraph that holds the answer.
- Minimal reading for each activity.
- Clear and concise directions printed in bold type.
- Word or phrase banks to assist students with memory or recognition difficulty.
- Pictures and diagrams for visual stmulation and clarity.

The worksheets and study guides were developed using unit and chapter hierarchies that outline critical concepts, facts, and ideas based on Bloom's Taxonomy of Cognitive Levels.

2. *A computer-based system to match teaching options to teacher style and learner characteristics.* Information from the teacher style profile and learner profile is entered into the computer, which identifies any mismatch between student needs and teacher style. The computer prints out appropriate teaching options for each individual student along with examples of adapted materials appropriate for the student. (Additional money was provided by the AIU to fund the development of this system, and it is not commercially available.)

Contractor: Utah State University Developmental Center for Handicapped Persons

Contract Number: 300-82-0320
Grade level and subject: Secondary mathematics
Textbook adapted: Supplemental courseware for a variety of math texts
Product publisher: "Instructional Management System, Math" (For Apple, $179.00 + $5.00 handling), Grolier Electronic Publishers, Inc., Sherman Turnpike, Danbury, CT 06186, (800) 858-8858

Product:

Supplemental Arithmetic for Microcomputers (SAM) courseware. This is a material-generation and record-management program designed to be used by remedial education teachers as a supplement to traditional mathematics textbook series. It provides teachers with sequenced behavioral objectives and printouts of placement tests, individualized worksheets, and students' progress records. All objectives are cross-referenced to commercial mathematics textbooks so that the learner can continue learning the math concepts taught in the regular classroom after remediation with SAM.

APPENDIX B
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